Striking the Balance between Neighborhood Change and Income Diversity

Lessons from Metropolitan Atlanta

Phoebe J Mayor
5-1-2017
Advisor: Anna Joo Kim

Table of Contents

“It is striking that when places are poor and marginal to capital the causal reasons given for the poverty of those places center around the characteristics of the poor people who reside there; but when the places become destinations for reinvestment capital the (poor) people who already reside there play absolutely no part in that explanation.”

-Defillipis and Frasier

I. Executive Summary

In her 2006 study on social diversity in Chicago, Emily Talen asks the question, "Why are some places socially diverse in spite of overwhelming pressures to segregate?" (Talen 2006). This study asks: *why do some places in metropolitan Atlanta remain income diverse or become more income diverse despite rapid neighborhood improvements? Is it possible to have both?* In other words, are there neighborhoods where successful revitalization has happened without the typical accompanying negative social impacts?

Similar to Talen, this study aims to inform policy by identifying examples of "good" neighborhood change that could be further investigated as replicable models for equitable revitalization policies or development practices. Instead of identifying where negative impacts from rapid gentrification have happened in Atlanta, this research focuses instead on where the expected consequences of such neighborhood change *have not* happened. Three distinct quantitative analyses are conducted to analyze this question. The main variables used to investigate the complex, interrelated social and economic consequences of such neighborhood change are income diversity (social) and home value (economic).

Modeling much of my framework and analytical methods off those used by Talen in her 2006 study, I analyze changes in ten socioeconomic and housing variables at the census tract level from 2010 to 2015. Multiple regression analyses and spatial analyses are used to identify both explanatory and spatial relationships regarding income diversity and neighborhood change throughout Metropolitan Atlanta. The ten county region is used the for the regression analysis while the core five county region (632 census tracts) is used for income diversity index calculations, income diversity spatial visualizations and for the final quartile calculations used to identify neighborhoods that defy expectations for neighborhood change. Neighborhoods defying these expectations are referred to as "change outliers", although this is not identified through statistical means.

The three layers of analyses provide varying results, many of which fit with assumptions defined in the paper. It appears that income diversity has changed to varying degrees throughout the five counties and census tracts, with no clear patterns of spatial clustering. The lack of clustering suggests the unique patterns of change that occur from neighborhood to neighborhood, even among adjacent neighborhoods. Conversely, the city of Atlanta experienced some distinct spatial patterns regarding degree of change in income diversity. The two statistical regressions that follow test numerous explanatory relationships in order to investigate predictors of income diversity. The variables addressing racial composition, vacancy rate, home values and housing stock diversity show highly significant relationships with predicting income diversity. Population density variables have significance values greater than 0.05.

Finally, quartiles are calculated for select variables in order to identify thirty-three neighborhood change outliers. If a neighborhood has experienced both of the following changes between 2010 and 2015, it has been identified as an outlier: highest increase in home value (selected by quartile calculations), and highest increase in income diversity (selected by quartile calculations). Through this analysis, thirty-three tracts (out of 632) were found to be change outliers. These neighborhood change outliers are further narrowed based on those that *did not* experience an increase in percent non-Hispanic White. Four of these neighborhoods are dissected in more detail to provide more context for these potential models for neighborhood change. Further research is suggested in order to identify which of these thirty-three tracts are true models for balanced neighborhood change.

II. Introduction

The neighborhood change indicators used for this research have been selected after careful review of various models for measuring gentrification and social diversity. This introduction and the following literature review provide a deeper context for the driving research questions and detail the theoretical basis and analytical framework used for exploring these complex changes.

In March 2015, a Business Insider article referenced the 2015 Brookings Institution report on income inequality in the U.S., confirming that, "Atlanta's top incomes grew faster than any other US city between 2012-2013 while its lowest wages remained stagnant […]". The author goes further to say this finding made Atlanta the city with the highest income inequality gap in America for the second year in a row (Bertrand 2015). The widening gap indicates a negative impact on prospects of economic mobility for low-moderate income residents. Although less obvious, this income inequality can also be tied to positive and negative reinvestment impacts on historically disinvested or stagnant neighborhoods. These neighborhoods are often an investment opportunity for individuals and corporations with more economic and social choice and mobility. This investment is not inherently negative; in fact, it can benefit these neighborhoods and existing residents. Similarly, new residents are not inherently negative and can contribute to an increased racial and economic diversity that can benefit both new and historic residents. However, this report posits that it is the degree of change and the presence of policies aimed at maintaining existing residents' housing stability that can affect whether this investment has negative or positive long-term impacts.

This research investigates changing social and economic conditions of neighborhoods throughout Metropolitan Atlanta in order to identify neighborhoods that have defied expectations of neighborhood change. According to claims put forth in this research paper, neighborhoods

identified as defying such expectations are examples of neighborhoods that have experienced a balanced or healthy neighborhood change. The parameters for "expected neighborhood change" utilized in this research are informed by existing literature on topics of neighborhood revitalization, gentrification, and social diversity. Various statistical and spatial analyses are conducted in order to evaluate the "tipping point" of neighborhood change. As mentioned previously, it is often the rate and intensity at which this change happens that can result in displacement of historic residents and neighborhood culture.

The process of change is often observed as the following: disinvestment leads to revitalization, revitalization leads to gentrification, gentrification (at a certain rate) leads to increasing home values, property taxes, and rents that in turn lead to displacement of "historic" or existing residents. The diagram in Figure 1 below demonstrates this simplified process, highlighting the point of interest for this research.

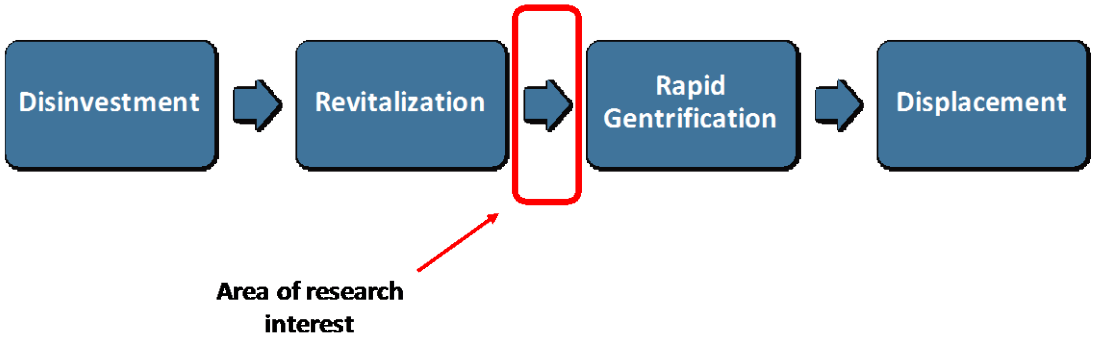


Figure 1. Neighborhood change process

Successful revitalization often influences not only the economic trajectory of a neighborhood but also the social make up and culture of that neighborhood. Whether or not the revitalization is a result of planned local efforts or individual investment pursuits, the process is often the same,

particularly when it comes to historically disinvested neighborhoods. There are numerous variables that can be addressed when analyzing the multi-layered dynamics of the nebulous processes of revitalization and gentrification. However, this research is concerned with the "tipping point" in this process, and accordingly, explores changes in ten variables at the 10-county Metro Atlanta region when running the regression analysis, and fewer variables at the 5-county region in order to look at general changes in income diversity and identify "outliers" of expected neighborhood change.

Two key areas of focus for this research are the degree to which neighborhood change indicators change within a five-year period and neighborhoods that defy expectations of patterns of rapid change that results in negative social impacts. The degree of change is important because, for example, increase in home values in a depressed neighborhood can often indicate positive change for that neighborhood's physical environment and residents. However, when home values increase rapidly, it often leads to displacement of low-income residents as well as displacement of existing businesses or even of the culture characterizing that neighborhood.

The research uses income diversity as the main measurement of social change and home price value as the main indicator of neighborhood improvement. First, I define gentrification and review existing literature that has measured this process as a way to set a standard for the hypothesis that investigates *expectations of neighborhood change*. Second, the literature review addresses the importance of social diversity, particularly explaining Emily Talen's article that will be used as a framework for all three steps of quantitative analysis. In particular, the regression run for this analysis is modeled off Talen's study with only slight modifications.

Literature Review

Diverse review of existing literature is necessary to establish an informed measurement for the kind of "neighborhood change" the research investigates. Before detailing the various models for measuring and defining gentrification, it is necessary to first define the concept. Housing affordability and involuntary movement of residents are among several other intertwined factors associated with gentrification. Neil Smith is commonly cited for defining gentrification as, "the process by which central urban neighborhoods that have undergone disinvestments and economic decline experience a reversal, reinvestment, and the in-migration of a relatively well-off middle- and upper middle-class population" (Smith 1998). Smith is also known for his rent gap theory that he first proposed in his undergraduate dissertation in 1979. This theory claims that as disinvestment spreads and amplifies it creates opportunities for developers, investors, homebuyers and local government to gain profit (Slater 2016). This "see-saw", as Smith refers to it (1984), is at the crux of gentrification.

Smith's theories point to capitol as the sole reason for the divides that happen due to this movement, and perhaps also as the sole cause of the reinvestment patterns. As Slater describes it, Smith's writing argues that, "the class struggle in gentrification is between those at risk of displacement and the agents of capital who produce and exploit rent gaps" (Slater 2016). Other scholars, such as Damaris Rose, have argued the opposite—that human agency plays a dominant role in this movement of reinvestment (Rose 1984). The steps of this research that evaluate the definition of "expected neighborhood change" are informed by a comprehensive review of gentrification measurement models that acknowledge "agents" behind gentrification—recognizing that both structural systems and human choices, including humans' different abilities

to choose, contribute to these patterns of investment and physical and social changes. The following section reviews literature that utilizes different gentrification models.

Measuring Gentrification

While the reasons behind what actually spurs gentrification is important, the factors that indicate whether gentrification has occurred, and to what extent, are necessary to draw any conclusions for the purpose of this research project. In article titled, "Toward a Universal Operationalization of Gentrification", Kristin Williams discusses the different ways gentrification has been researched and measured, both quantitatively and qualitatively. She categorizes the various measurements as either structural changes that happen due to gentrification or socio-demographic changes. The bulk of these factors are compiled and presented in Table 1 below.

Table 1. "Toward a Universal Operationalization of Gentrification"

Kristin N. Williams

Structural Changes:	Socio-demographic Changes:
• Rent values • House and Property values • Number of housing units • Number of newly constructed homes • Number of issued demolition permits • Mortgage capital growth	• Average family income • Median household income • Percentage of college graduates • Percentage of residents in managerial or professional occupations • Proportion of homeowners • Poverty rates • Rates of unemployment and employment • GINI coefficient • Proportion of middle aged adults
Sources: Hammel and Wyly 1996; Knotts and Haspel 2006; Galster and Peacock 1986; Nelson et al. 2010; Dye and McMillen 2007	Sources: McKinnish et al. 2010; Galster and Peacock 1986; Hammel and Wyly 1996; Knotts and Haspel 2006; Glick 2008; Hudspeth 2003; Eckerd 2011; Nelson et al. 2010; Atkinson 2000

These variables used to measure gentrification are cited from numerous scholarly articles (as seen in the bottom row of the table). Some of these variables have been used in numerous models, while some variables have only been used in one model. For example, “number of issued demolition permits” has been used as a measurement only by authors Dye and McMillen (2007), while “house and property values” has been used in at least three different research articles. Williams also references other types of measurements, such as those that have been used more recently in an attempt to measure “cultural” shifts. For example, some researchers have looked at the increase in coffee shops in an area (Papachristos et al. 2011). However, due to the scope of this study, cultural shift measures such as this are not used in the variable sets.

In 2016, Flanagan et al. completed a paper looking more specifically at cycling infrastructure and its connection to gentrification. While this research addresses a different actor (‘cycling’ in place of ‘revitalization plans’), the authors design and utilize measurements for gentrification. Different from any study approaches mentioned in Williams article, these authors define indicators for “gentrification” and “privilege”. Table 2 below presents the numerous indicators used in this study.

Table 2. “Riding tandem: Does cycling infrastructure investment mirror gentrification and privilege in Portland, OR and Chicago, IL?”

Elizabeth Flanagan, et. al.
Gentrification and Privilege indicators:
• Percent non-white • Percent renter-occupied units • Percent with college education or higher • Percent unemployed • Percent new resident since 2009 • Median household income • Median age

Interestingly, this study does address race while all studies cited in Williams' piece do not address race, or at least do not point to race as a gentrification indicator. Williams points out a rationale behind this, arguing that racial composition should be studied as a possible consequence due to gentrification. She explains that, " [e]xcluding racial composition shifts from the operationalization of gentrification also allows researchers to explore how the racial configuration of a gentrifying neighborhood shapes how reinvestment unfolds in an area" (Williams 2015). She elaborates further to explain that gentrification can be "differentially consequential" for black and white communities (2015). While the point offers some valid consideration, many of these factors are, similarly, consequences of gentrification. Race and class are key components of this "see-saw" dynamic. Additionally, racial composition gives some insight into the movement of existing residents. Although class is the focus for this study, both are addressed in this study for these reasons.

The gentrification models detailed here justify a simplified set of criteria that is used in the final step of quantitative analysis for this report. While many of the aforementioned models incorporate numerous distinct variables, this study is not centered on explaining gentrification. The study is more broadly researching neighborhood change and how that relates to social factors, principally income diversity. Therefore, there is no distinct gentrification model that is used. Rather, the aforementioned literature provides background for how one can think of these patterns of neighborhood change. These studies provide a basis for the variables that are used in the final step of analysis to analyze whether or not a neighborhood has defied expectations of neighborhood change, principally that change that is expected from rapid gentrification once a disinvested or stagnant neighborhood begins to experience increased investment. These variables are the following: percent non-Hispanic White, median home value and income diversity.

Social Diversity and Income Diversity

Social diversity, more specifically income diversity, is a key overarching concept driving the hypotheses for this paper. Emily Talen's research regarding social diversity in Chicago is the guiding framework for this paper's quantitative methods. Talen references smart growth and new urbanism advocates as being publicly vocal about the importance of social diversity, as further evidence of the validity in studying predicting factors of social diversity. Talen cites two prevalent arguments for social diversity at the neighborhood-scale. The first is that social diversity facilitates more equitable distribution of resources, referencing the "geography of opportunity" concept as explored by authors Galster and Killen in their 1995 article indicating spatial relationships to access to opportunity (Galster & Killen 1995). The second reason is that social diversity can contribute to an educational exchange in which the individuals or families learn about other backgrounds, cultures, and class brackets.

Talen references author Xavier de Souza Briggs as addressing the distribution of equitable sources as a benefit of social diversity. Briggs specifically explores this relationship in the context of housing choice and racial segregation in his book titled *The geography of opportunity: Race and housing choice in metropolitan America*. Briggs compares America's metropolitan areas to those similar areas in Europe, concluding that America's metropolitan areas are particularly sprawling and segregated by race and class. These two conditions create an uneven "geography of opportunity" (Briggs 2006). Briggs argues that, "[u]nderstanding and changing that geography is crucial if America is to improve outcomes in education, employment, safety, health, and other vital areas over the next generation" (2006).

The cross-cultural exchange that results from neighborhood-level social diversity benefits people at all income levels. Many studies that investigate the impact of racial and income diversity conclude that this exchange benefits low-income individuals, in particular studies that research benefits of mixed-income developments. The argument is often that low-income residents can build social capitol, gaining possible career connections, for example, that they might not otherwise have had access to among a neighborhood of majority low-income residents. The more paternalistic arguments conclude that higher income individuals act as positive role models when integrating into predominately low-income communities (Duke 2009). Authors such as Joanna Duke go so far as to say that higher-income residents can model positive standards of behavior and parenting skills for the low-income residents. However, these conclusions are associated with biased assumptions about a person based on their level of income or race and fail to acknowledge the other forms of social capital that exist among networks of low-income residents. Additionally, as Briggs points out in his 2005 article on social mixing and *geography of opportunity*, regardless of who benefits from whom, there is no guarantee that residents will develop meaningful relationships by living in the same development or neighborhood (2005).

Despite these contradictory conclusions, this study pursues investigations of income diversity based on the assumptions that, while not every resident will necessarily develop meaningful relationships with diverse neighbors, there is a social value to communities that have some level of income-diversity. The strongest argument for neighborhood income diversity is the conclusion that individuals and families have increased access to resources and economic mobility when located in income diverse neighborhoods, supported largely by Briggs' research on race and housing choice in America.

Building on this literature, Talen further concludes that social diversity is a key ingredient to healthy neighborhoods and increased mobility for residents. Talen emphasizes her key goal in investigating this topic as being the need to further explain the complexity the topic brings and, therefore, better understand the challenges that planning and policy practitioners face in addressing this topic effectively in order to close gaps of inequality. After establishing the importance of social diversity, Talen details her key research questions in order to address this complex topic. As referenced earlier, Talen asks, "*[w]hy are some places socially diverse in spite of overwhelming pressures to segregate?* (Talen 2006). In order to measure this, she explores the spatial patterns of social diversity as well as the variables that predict social diversity. Talen uses a quantitative, GIS-based approach to explore these interactions and conditions in the context of Cook County, Illinois, which includes the city of Chicago. Although variations on her methods are implemented in this research, Talen's model provides the main framework for this study of neighborhood change in Metropolitan Atlanta.

IV. Methodology

The multi-layered quantitative analysis aims to addresses the following questions: *Which neighborhoods have high income diversity? Which neighborhoods have become more income diverse? What socioeconomic factors predict increases in income diversity? Which neighborhoods have defied expectations for neighborhood change?*

Three layers of quantitative and spatial analysis were conducted to evaluate income diversity and neighborhood change. The multiple layers facilitate an analysis that assesses statistically significant relationships and spatial patterns. The five county income diversity and

neighborhood change outliers spatial analyses do not provide statistically significant results but rather provide a deeper layer and geographic context to the regression results. These layers involve the following methods: calculation and spatial Analysis of Income Diversity Index, multiple regression analysis to identify variables that predict income diversity, and finally, the calculation and spatial analysis of neighborhood change outlier criteria results.

Study Area

There are two different geographic scales used depending on the analysis. The larger ten county Metro Atlanta boundary is used solely for the multiple regression analysis (732 census tracts). This boundary includes the following counties: Cherokee, Clayton, Cobb, DeKalb, Douglas, Fayette, Fulton, Gwinnett, Henry and Rockdale counties. The ten county region provides a larger data set that provides more statistically significant results for the multiple regression analysis. The core five county Atlanta region (632 census tracts) was used for the income diversity and neighborhood change criteria portions of the analysis. Figure 2 illustrates this five county study area, highlighting the City of Atlanta boundary in blue.

Methods

American Community Survey (ACS) 5-year estimates were used as the source for the data in this study, except for the data used regarding number of subsidized housing units in a census tract. The data for subsidized housing units was gathered from the Department of Housing and Urban Development's data portal site. The numbers for subsidized units in a tract encompasses all types of federally subsidized housing (project-based vouchers, mobile voucher, etc.). ACS 5-year estimates were used for any data referring to years 2010 and 2015. For example, "year

2010" refers to the ACS 5-year estimate from 2006-2010, and "year 2015" refers to the ACS 5-year estimate covering the period of 2011-2015.

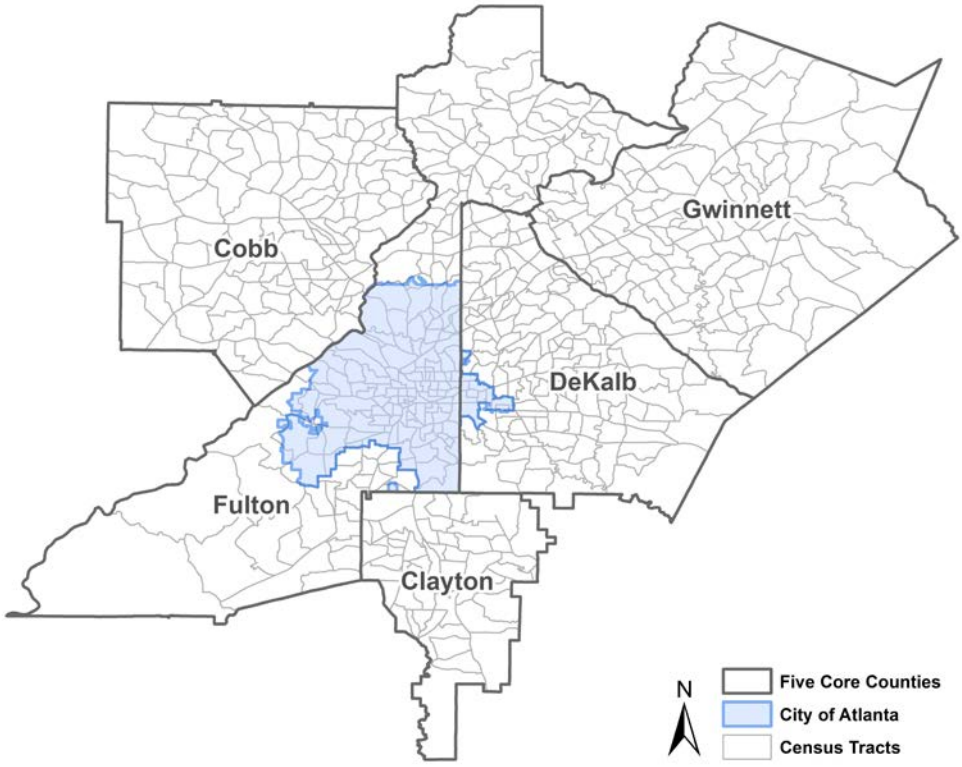


Figure 2. Study Area

Following Talen's methods, the Simpson biological diversity index formula was used to calculate the income diversity index for each census tract. The index ranges from one (low income diversity) to four (high income diversity). Emily Talen chose income ranges that she modeled from Massey and Fischer's 2003 study of income inequality (Massey 2003). Massey and Fischer used three different categories based on poverty thresholds for a family of four in 2000: poor, middle class and affluent. Talen used four categories, using roughly the same income range for the lowest and highest income categories used by Massey and Fischer. This report uses

the same four categories. The Simpson biological diversity index and the four income brackets used for this piece of the analysis are illustrated in Figure 3.

$$A = \frac{N(N-1)}{\sum_i n_i(n_i-1)}$$

N = Total pop in CT
n = Pop having *x* income

Income categories

Under $20,000
$20,000-39,999
$40,000-74,999
$75,000 and over

Figure 3. Simpson Biological Index

Table 3 further illustrates how the index was calculated per census tract. The index was calculated for all census tracts within the ten county boundary.

Table 3. Diversity Index Calculation

Census Tract	Total Population	N(N-1)	Under $20,000 n(n-1)	$20-39,999 n(n-1)	$40-74,999 n(n-1)	$75,000 and over n(n-1)	Income Diversity Index
13057090100	3195	10204830	132860	678152	673220	1403040	3.53
13057090200	2720	7395680	105950	237656	468540	1489620	3.21
13057090300	4272	18245712	156420	183612	1109862	5724056	2.54

The percent change in this index was calculated for the core five counties and mapped using GIS software. The spatial analysis illustrates the varying degrees of change in income diversity across neighborhoods and highlights potential clusters of change. The income diversity index was then used as the dependent variable for two separate multiple regression analyses using SPSS software. The income diversity index was regressed on ten independent variables that fall into the following categories: population density, socioeconomic factors (including presence of affordable housing), and residential diversity factors. Eight of these variables are the same as

those used in Talen's study. Two variables were added in this study: *number of subsidized housing units* and *percent non-Hispanic African American or Black.* One variable was excluded to avoid possible multicollinearity: *median home value diversity index.* The following three residential diversity index variables were calculated using the Simpson index formula: *housing unit type diversity index, year housing built diversity index, housing tenure type diversity index*.

The independent variable *number of subsidized housing units* is used in order to examine explanatory relationships between presence of affordable housing and income diversity. The independent variable "percent non-Hispanic Black" was used in the second regression in place of "percent non-Hispanic White" in order to explore potentially varying relationships that different racial groups may have with neighborhood-level income diversity. Emily Talen accounted for spatial lag autocorrelation by running a spatial lag model. However, due to the successful first regression analysis and time constraints, a correction for spatial lag was not necessary for this study's regression analyses. The variable sets used in this study are detailed in Table 4.

Dependent Variable	**Dependent Variable**
Income Diversity Index	Income Diversity Index
Independent Variables	**Independent Variables**
Population Density	Population Density
Population Density Squared	Population Density Squared
Percent non-Hispanic White	*Percent non-Hispanic Black*
Percent Vacant	Percent Vacant
Median Home Value	Median Home Value
Number of Subsidized Units	Number of Subsidized Units
Residential Diversity	**Residential Diversity**
Housing unit type diversity index	Housing unit type diversity index
Year housing built diversity index	Year housing built diversity index
Housing tenure diversity index	Housing tenure diversity index

Table 4.. Regression Variables

The final analysis layer calculates the quartiles from two variables in order to identify neighborhoods that fit defined criteria for "defying expectations of neighborhood change". Quartiles were calculated for the percent change numbers for *income diversity index* and the percent change numbers for *median home value* (percent change from 2010 to 2015). Neighborhood change outliers were then selected if they met the following criteria: falls in the fourth quartile four percent change increase in median home value *and* percent change increase in income diversity index. Finally, these outliers were mapped in order to explore possible clustering or patterns of change throughout the five counties, with a particular focus on change outliers within the City of Atlanta.

V. Results

The three layers of analyses provide varying results regarding identification of spatial patterns, statistically significant relationships with income diversity, and neighborhood change outliers. Based on visualization of the changes in income diversity, it appears that income diversity has changed at varying degrees throughout the five counties and throughout the census tracts. The lack of spatial clustering suggests the unique patterns of change that can happen from neighborhood to neighborhood, even among adjacent neighborhoods. The City of Atlanta reveals some level of spatial patterns regarding degree of change. Following the income diversity spatial analysis is the two statistical regressions that test numerous explanatory relationships in order to investigate predictors of income diversity. The variables addressing racial composition, vacancy rate, home values and housing stock diversity show highly significant relationships with income diversity. Population density variables are the only variables with significance values greater than 0.05.

Finally, quartiles are calculated for select variables in order to identify thirty-three neighborhood change outliers. These neighborhood change outliers are further narrowed based on those that *did not* experience an increase in percent non-Hispanic White. Four of these neighborhoods are dissected further to provide more context for these potential models for neighborhood change.

Income Diversity Index

The percent change in income diversity index from 2010 to 2015 was calculated for all census tracts within the five counties and then mapped to illustrate possible spatial patterns. Figure 4 shows these changes at the five county level while Figure 5 provides a closer look at the City of Atlanta. It is important to highlight the fact that the dark green tracts do not necessarily have high income diversity indices (3.0-4.0) but are the tracts that have experienced a sharp increase in income diversity, regardless of the index score. Similarly, a percent change increase in income diversity illustrated in the map does not provide information on what type of increase has occurred. For example, a predominately low-income census tract could have experienced a sharp increase in income diversity due to an influx of middle to high-income residents. The opposite could also be true—a predominantly high-income neighborhood could have had an increase in middle to low income residents, or perhaps could have experienced a significant number of high income residents moving out.

Figure 4 and 5 shows the percent change in each census tract's income diversity index from 2010 to 2015. The percent change ranged from decrease of -0.42 and an increase of 0.58 in other tracts. It is important to note that these numbers are small because the index itself only ranges from one to four. For example, Census tract 402.02 in Clayton County increased from 3.28 in

year 2010 to 3.47 in year 2015. Therefore, the tract experienced a percent change increase in the income diversity index of 0.06. Interestingly, about half of the census tracts experienced either a decrease or no change in income diversity. A little over half of the census tracts experienced an increase in income diversity. Only 48 census tracts (8% of the total number of census tracts) experienced an increase of income diversity of 0.20 or higher. This is the fourth bracket of change in income diversity shown in the legend in Figure 4.

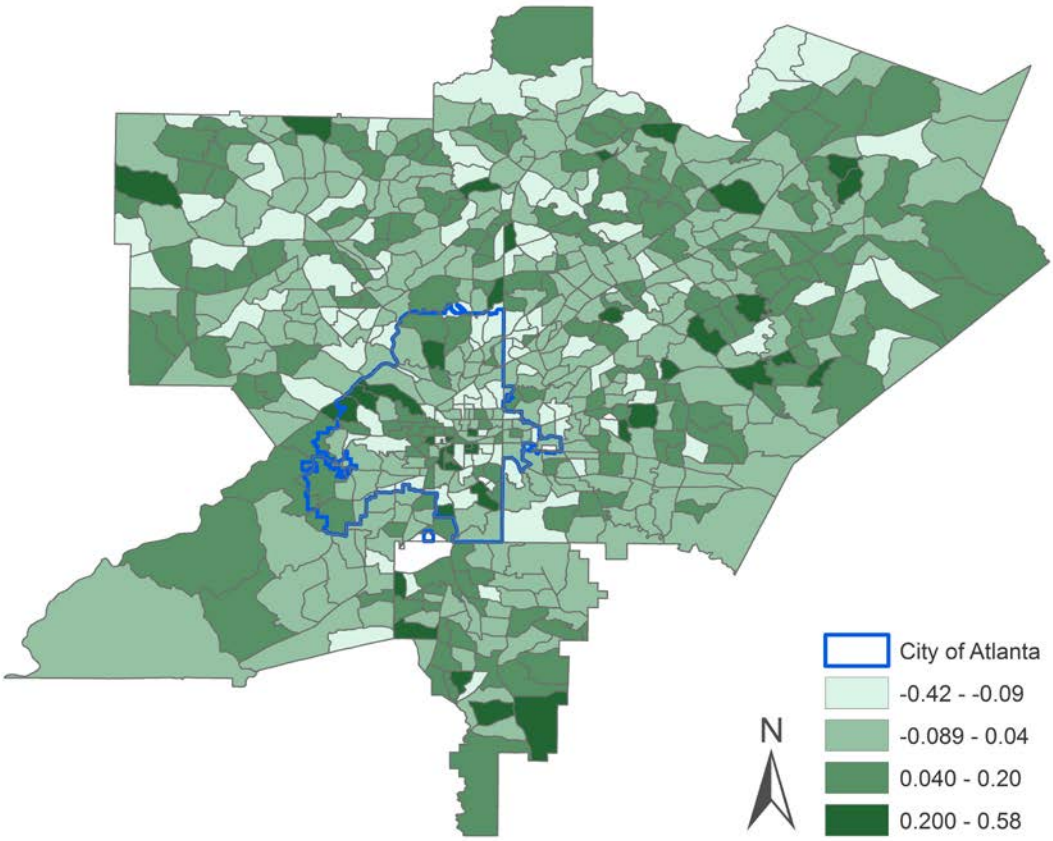


Figure 4. 5-County Income Diversity Index

Generally, there does not appear to be a strong pattern of spatial clustering when it comes to degree of change in income diversity indices. Talen's spatial analysis showed clear patterns of higher density in the inner ring of Chicago, however, her maps were illustrating the distribution

of income diversity indices for one year not the *change* in income diversity. This study is more concerned with degree of change in these factors as it is investigating unique patterns in these kinds of changes associated with rapid revitalization or gentrification.

The only clear pattern is the tracts that have experienced a strong decrease in income diversity. The majority of tracts that fall within the lowest category for percent change (ranging from -0.42 to -0.09) are located north of the South Atlanta boundary. While there are several tracts within the city of Atlanta that decreased in income diversity, many of the tracts that saw a sharp decrease are located within Cobb, Dekalb, Gwinnett and north Fulton counties.

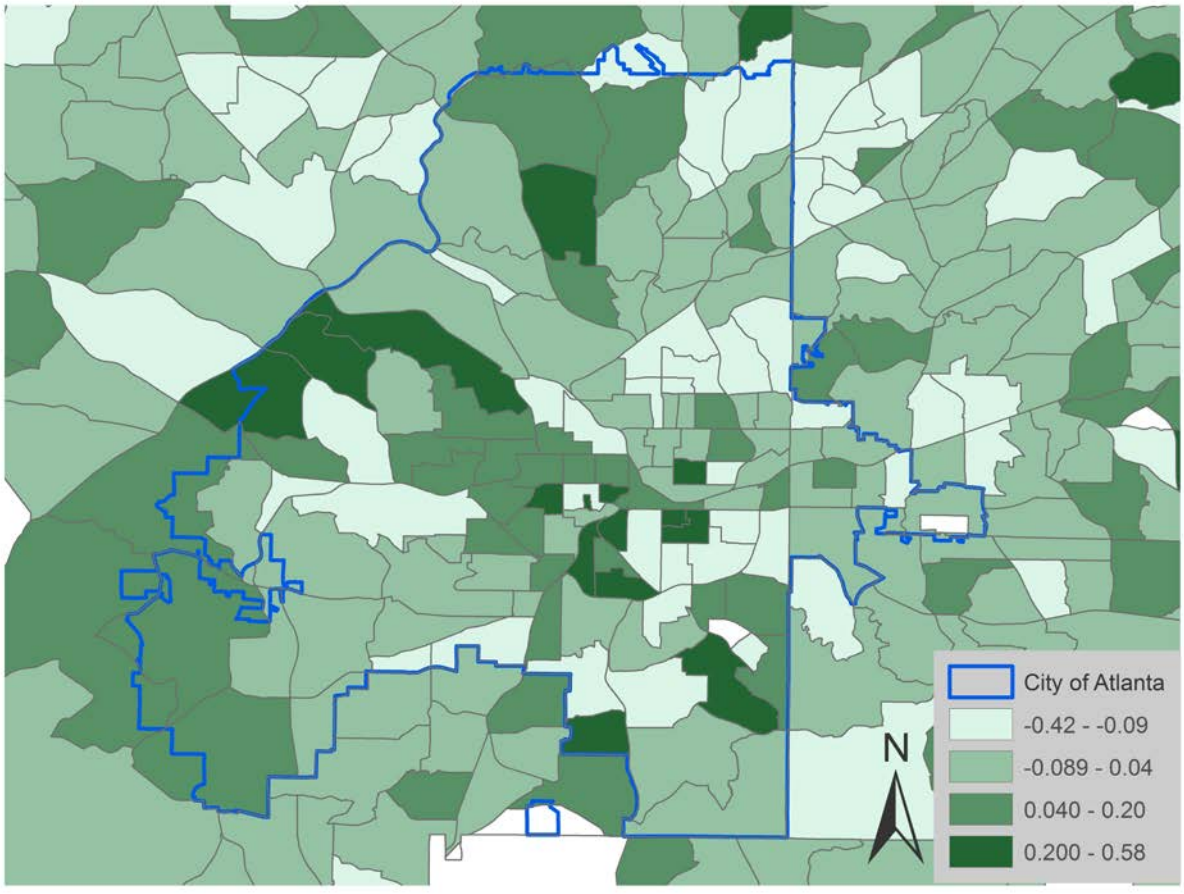


Figure 5. Atlanta Income Diversity Index

Figure 5 zooms in on these results in order to explore the change in the metropolitan core—City of Atlanta. City of Atlanta appears to have more closely related spatial patterns of change in income diversity within these five years. Although all four ranges of change are present throughout the city boundaries, adjacent tracks tend to show similar range of change in income diversity. It is interesting to note the juxtaposition of the sharpest degrees of change (lowest range of change and highest range of change), particularly around the center of Atlanta and continuing to the eastern portion of the city.

As highlighted previously, these changes do not necessarily reveal which type of income mixing has occurred. Additionally, this visualization does not explain whether the change is due to historic residents leaving the neighborhood, new residents moving in, and gives no indication of whether these were movements of choice or results of displacement. However, the visualization is a start to investigating such patterns. Further steps of analysis examine explanatory relationships that predict changes in income diversity.

Multiple Regression

As evidenced by the histogram, P-P plots of the standardized residuals and the Adjusted R square results, shown in Appendix A through Appendix D, the two regressions are strong fits to the model and have strong levels of normality. Both regressions have Adjusted R Squares over 0.65 indicating that over 65% of the variance in income diversity is explained by the independent variables. The tolerance and VIF results (see appendix) confirm that no significant multicollinearity exists between variables. High multicollinearity indicates intercorrelations between independent variables. Intercorrelation often causes disturbance in the data so this confirms that no such problem exists with the data in these regressions. Although Talen did not

cite strong multicollinearity in the residential diversity index measurement for "home value diversity index", this independendent variable was excluded from these regressions to avoid possible multicollinearity with the independent variable "median home value".

Regression 1 (Table 5) includes percent non-Hispanic White as an independent variable (to be referred to as percent White) and regression two replaces percent White with percent non-Hispanic African American or Black (to be referred to as percent Black). Several of the explanatory relationships between the other variables and income diversity have similar results in each regression. However, the degree of significance does change in a few variables and the coefficients show some differing results.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.823[a]	.677	.673	.374606976902764

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	2.119	.101		21.032	.000
Pop_Dens	-.015	.009	-.087	-1.650	.099
Pop_DensSQ	.001	.000	.081	1.658	.098
P_White	-.547	.082	-.237	-6.665	.000
P_Vacant	-.771	.227	-.095	-3.395	.001
Med_HVal	-.002	.000	-.460	-14.890	.000
Subsid_Units	-.001	.000	-.159	-6.619	.000
Unit Type_Diversity Index	.087	.012	.190	7.111	.000
Tenure_Diversity Index	.789	.056	.346	13.981	.000
Year Built_Diversity index	.139	.024	.147	5.907	.000

Table 5. Regression 1 Results

Population is the least significant independent variable, but is still relatively significant in regression one. Similar to Talen's findings, this study's model finds that population density is

non-linear; however, the direction of this relationship is opposite to what Talen found in Chicago. Regression 1 finds that for every point increase in population density (population/acre), the income diversity index decreases by 0.015 points. It is important to remember that the income diversity index ranges from one to four, so, while 0.015 is still a small change, it is not quite as small as it sounds considering the range of 1.0 to 4.0. Conversely, the relationship between *population density squared* and income diversity is found to be the following: for every point increase in density squared, income diversity index *increases* by 0.001. Emily Talen found that increase in population density results in an increase in social diversity but only to a degree, because she found that population density squared results in a decrease in income diversity (Talen 2006). However, this study finds the opposite.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.816[a]	.665	.661	.381247269448443

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.764	.100		17.722	.000
Pop_Dens	-.006	.009	-.036	-.687	.493
Pop_DensSQ	.000	.000	.046	.942	.347
P_Black	.308	.072	.145	4.262	.000
P_Vacant	-.671	.240	-.083	-2.795	.005
Med_HVal	-.003	.000	-.530	-18.872	.000
Subsid_Units	-.001	.000	-.169	-6.604	.000
Unit Type_Diversity Index	.101	.012	.222	8.133	.000
Tenure_Diversity Index	.822	.057	.360	14.390	.000
Year Built_Diversity index	.119	.024	.126	5.004	.000

Table 6. Regression 2 Results

Population density does have one of the least significant relationships so this is not a major point of focus; however, it could be that the difference exists due to the difference in density between the two cities. Talen's study also had much higher coefficients associated with both density and density squared. These larger coefficients and higher significance results in Talen's study generally shows that population density has a much stronger explanatory relationship with income diversity in Chicago neighborhoods than it does in Atlanta neighborhoods. This may change as Atlanta becomes increasingly dense. However, it is also important to note that this regression analysis uses data across ten counties, including many suburban areas, while Talen's study is only looking at Cook County. The number of census tracts in this regression is only about one hundred tracts less than that incorporated by Cook County, however, the difference in proportion of tracts located in more urban and dense areas likely explains some of these differences. While regression one showed low significance for population density, regression two (shown in Table 6 on page 24) shows that density has very low significance levels in explaining income diversity when *percent Black* is added as an independent variable.

The race variables, vacancy rate variable and tenure diversity index variable have the largest coefficients in both regressions, and all three variables have strong significance values in explaining income diversity. Although *number of subsidized units* was added to provide insight into the relationship between presence of affordable housing (federally funded or Low Income Housing Tax Credit units), the coefficient in both regressions was very small. While the variable does show strong significance, a more comprehensive list of affordable housing units may have resulted in results that are more robust. The unit numbers taken from the HUD website are

accurate with the data they provide, however, the numbers per census tract appear to be low suggesting gaps in the data provided by HUD.

Regression 1 indicates that for every percentage point increase in percent white, the income diversity index decreases by 0.55 points. This is a large change in income diversity. Conversely, regression two shows that for every percentage point increase in percent Black, the income diversity index increases by 0.31 points. This indicates that higher presence of Black residents predicts higher income diversity while higher presence of White residents predicts lower income diversity. This indicates that, in the context of Atlanta, there is possibly less income diversity among spatially concentrated White neighborhoods. This could also mean that Black residents are more likely to move into neighborhoods with varying income levels while White residents might be less likely to move into income diverse neighborhoods. Further research would be necessary regarding the relationship between changes over time in order to support these hypotheses.

In both regressions, increase in vacancy is associated with a decrease in income diversity. In regression one, for every percentage point increase in vacancy, the income diversity decreases by 0.77 points. This is close to an entire index point decrease. Regression 2 is similar but results in a slightly smaller coefficient of 0.67. Emily Talen's study found a similar directional relationship with vacancy explaining a decrease in income diversity in Chicago. Similar to Talen's results, this study's results contradict what has been found by others, such as Galster, indicating that higher vacancy rates predict more income mixing (Galster et al. 2005).

Lastly, the tenure diversity index variable resulted in the largest coefficients in both regressions, regardless of the race variable included. In regression two, results indicate that for

every point increase in the tenure diversity index, the income diversity increases by 0.82 points. The coefficient is not much different in regression one—0.79 points. Similarly, Emily Talen's analysis found tenure diversity to have the largest coefficient among the four residential diversity variables she used. It is interesting that tenure diversity has a coefficient so much larger than unit type diversity. It is unsurprising, however, as homeownership is often associated with a degree of financial stability that many in the United States strive to achieve if they are able to. Therefore, it makes sense that a neighborhood with homeowners and renters would likely also have higher levels of income diversity.

Neighborhood Change Outliers

In order to define criteria for "defies expectations of neighborhood change", high increase in median home value between 2010 and 2015 acts as a proxy for rapid gentrification, while high increase in income diversity between 2010 and 2015 is viewed as an indicator of social change. The neighborhoods that meet these criteria are referred to as "change outliers", although it is important to note that "outlier" does not refer to statistical significance. Quartiles are used to assess which tracts defy the following assumed trend of neighborhood change: when home value increases rapidly, income diversity decreases. In other words, the hypothesis that the analysis aims to disprove is: when median home value increases, income diversity index decreases. This layer of analysis is not statistically significant but provides a basis of information on *degree* of neighborhood change and also addresses, to an extent, the complex directional changes that may be in tandem or inverse between the economic and social composition and stability of the neighborhood. Thirty-three tracts out of the 632 total tracts, about 5%, fit the first set of criteria for "change outliers": quartile four for both change in income diversity *and* change in median home value. These tracts are highlighted in Figure 6 below.

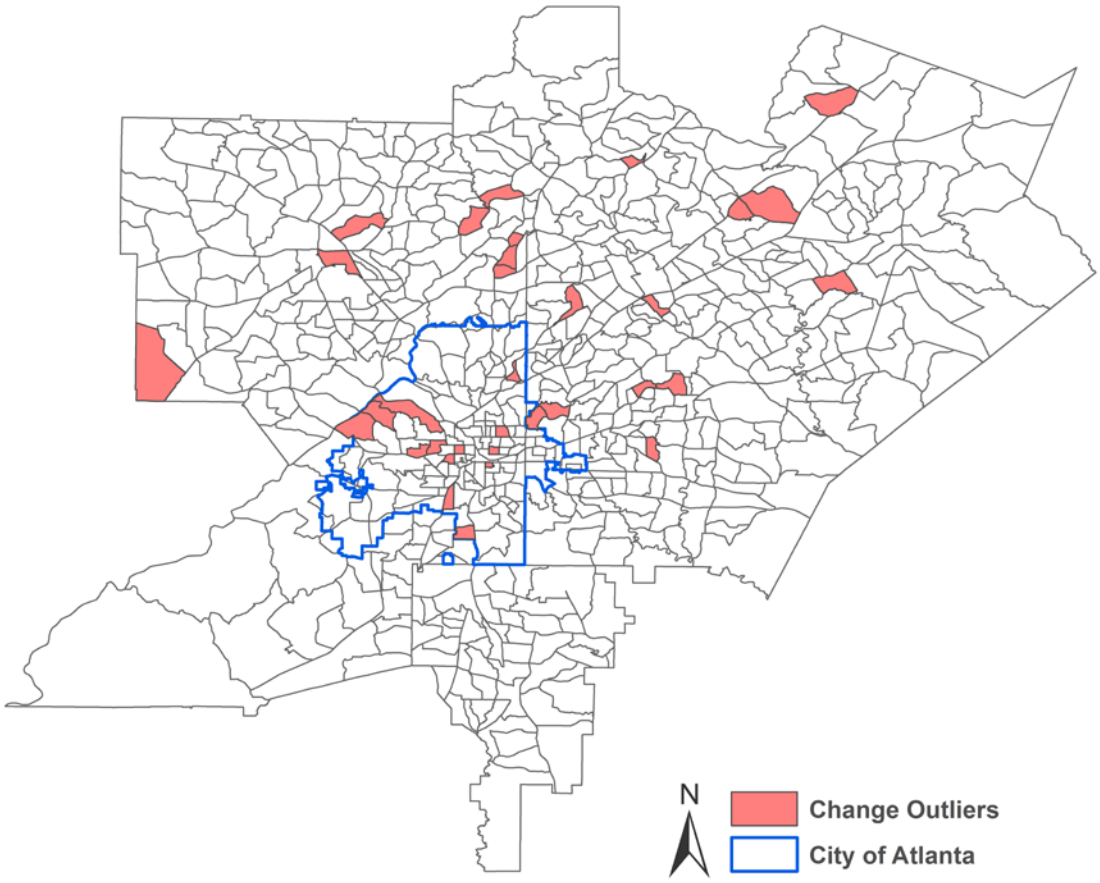


Figure 6. Change Outliers

It is interesting to see that every change outlier is within the city of Atlanta boundaries or north of Atlanta. About half of the outliers are within the city of Atlanta. This indicates that the core of Atlanta (core of Fulton County) has seen proportionally more cases of drastic neighborhood change over the past five years as compared to the other counties throughout the metropolitan region.

In order to provide more context for what kind of income diversity change is happening and in order to more accurately identify neighborhoods that defy the rapid gentrification process that the study is investigates, a second layer of selection was added to the spatial analysis. Census tracts that experienced any increase in percent White population between 2010 and 2015 were

selected from the thirty-three outlier tracts already selected. These outliers are highlighted in red in Figure 7 below.

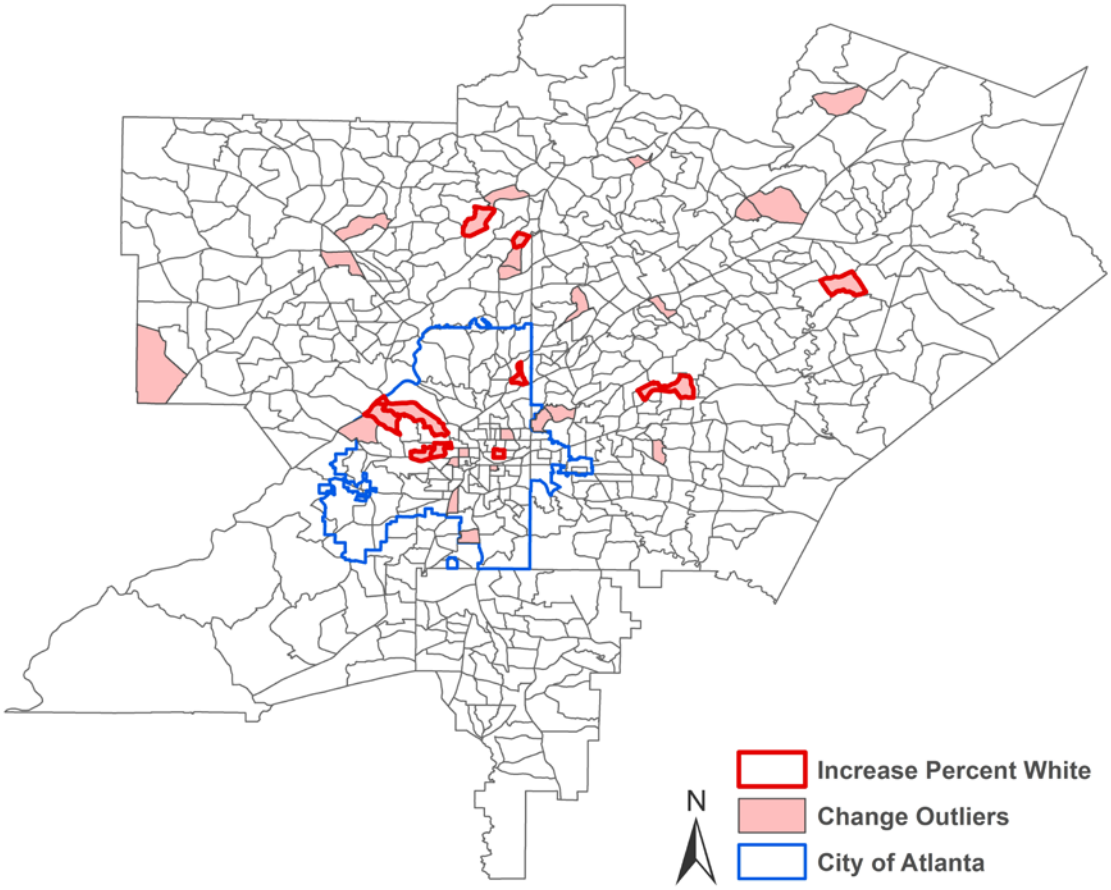


Figure 7. Change Outliers with increase in White residents

Eleven out of thirty-three "Change Outliers" tracts experienced a percent change increase in percent White and about half of these eleven are within Atlanta city limits. According to theories outlined and supported in this paper, the tracts in the above maps that are *not* outlined in red are the tracts that have possibly defied expectations for neighborhood change, or gentrification patterns. Depending on the existing conditions in 2010, or prior to 2010, these tracts are potential models for neighborhoods that achieved, or are in the process of achieving, a "healthy" and

balanced degree of neighborhood improvement that has not simultaneously resulted in negative social impacts, or at least has not yet experienced such changes. Figure x zooms in on the Atlanta region to highlight these differing neighborhoods and where they exist within the core Atlanta area.

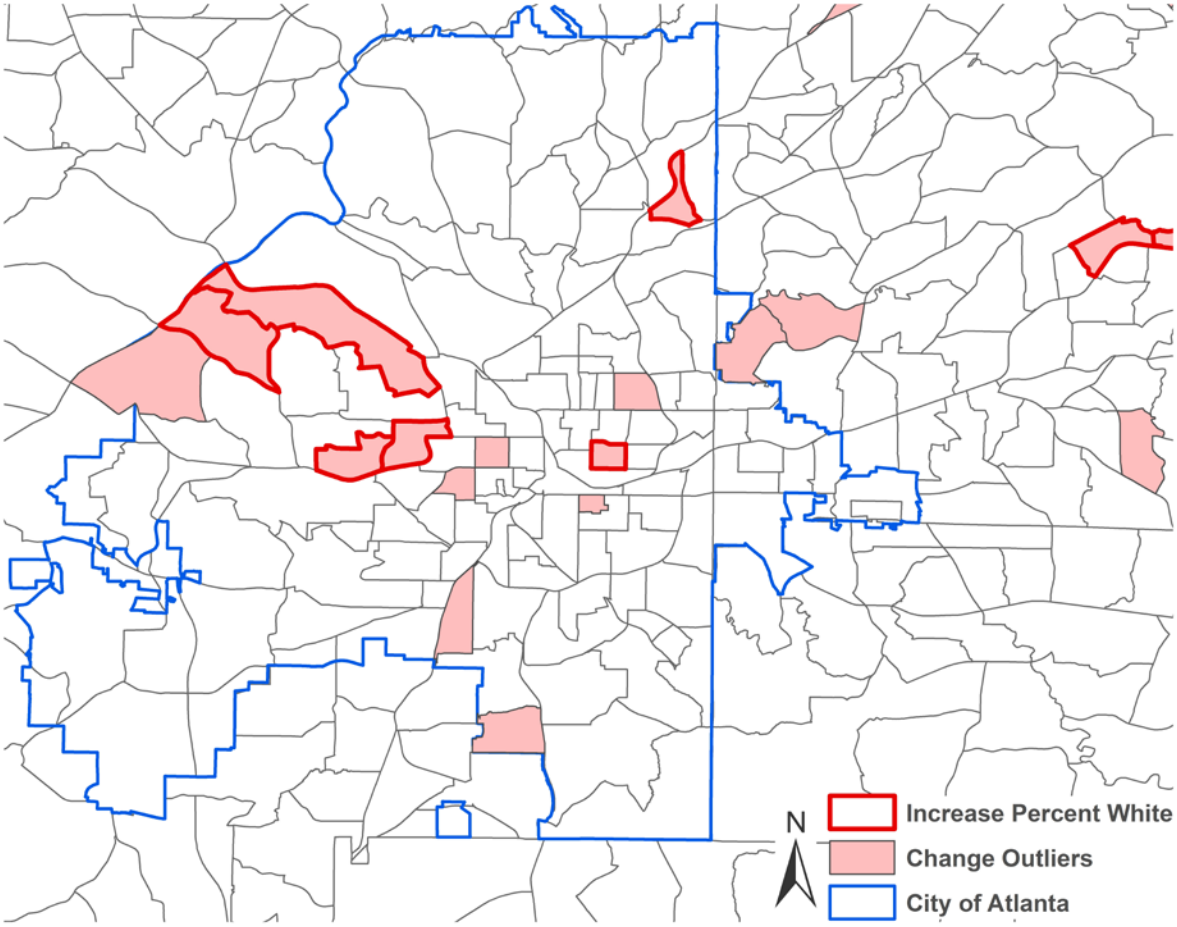


Figure 8. Atlanta Change outliers with increase in White residents

Figure 8 shows that those neighborhoods that saw a sharp increase in home value, sharp increase in income diversity, and an *increase* in percent White are located in either the center of Atlanta or northwest Atlanta. There is also one neighborhood located in north Atlanta, around the Peachtree Park neighborhood, that fit the neighborhood change criteria, but has been identified

as also having experienced an increase in percent White population. Those neighborhoods in red were then removed in order to focus analysis on the twenty-two remaining change outliers. Figure 9 illustrates the spatial distribution of this smaller selection of neighborhoods that meets the final criteria for neighborhood change outliers.

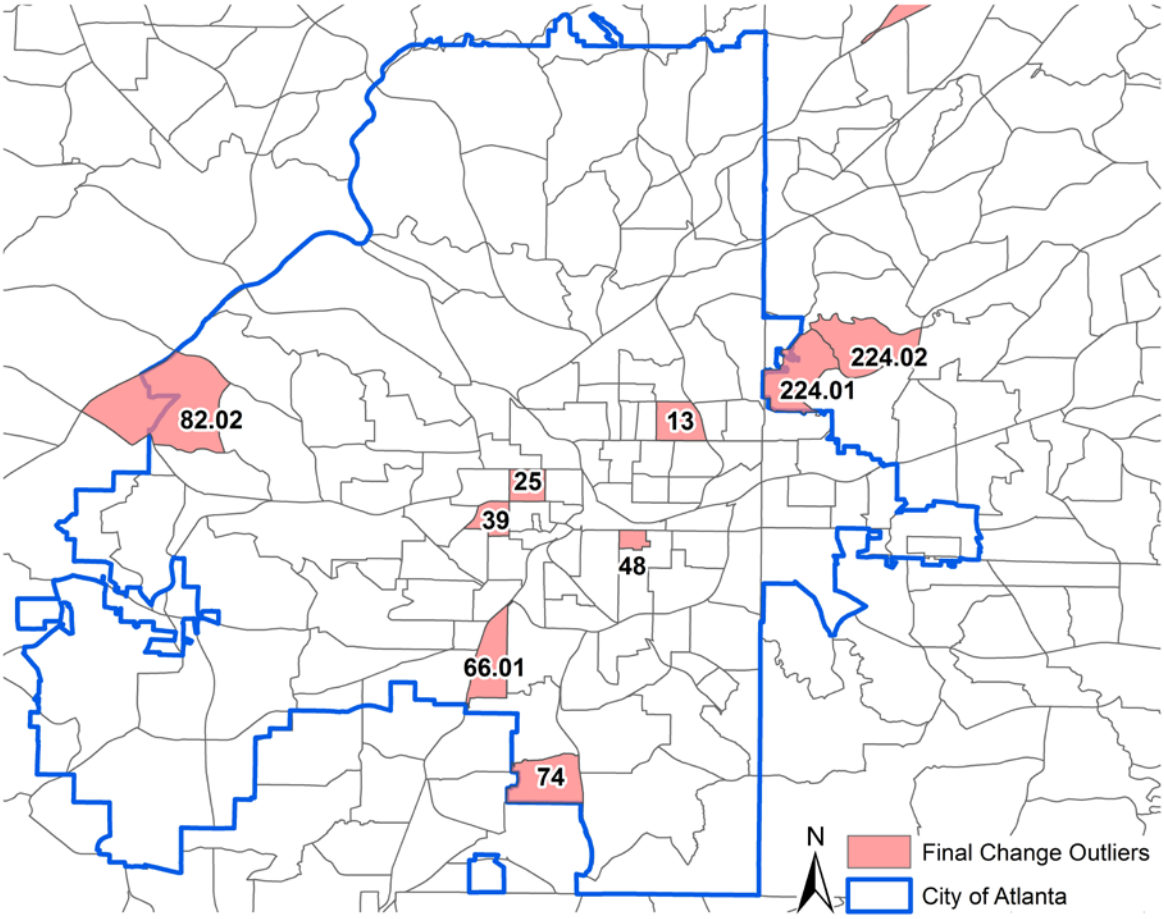


Figure 9. Change Outliers (final results)

The tracts identified make up only 3% of the total study area (632 census tracts). This small number confirms the theory that these tracts would be "outliers" or neighborhoods that stand out as places that have undergone unique patterns of change, and possible a rare "good" pattern change. Again, almost half of the outliers are within or touching City of Atlanta boundaries but are located in the center of Atlanta, south Atlanta, west Atlanta, and just east of

Atlanta. The final layer of this analysis identifies these census tract outliers by neighborhood name and details individual socioeconomic change factors for four of these neighborhoods in order to bring a local context to this five county analysis.

VI. Neighborhood Spotlights

One recommendation that is referenced in the conclusion of this report is to further investigate all twenty-two census tracts in order to identify trends or make connections with qualitative or anecdotal evidence that supports or contradicts the "outlier" status of these neighborhoods. However, this study only provides a brief dissection of four select Atlanta neighborhoods as a starting point for future research. The nine tracts identified in or adjacent to the core Atlanta are the following: Eastern side of Midtown (Tract 13), Sylvan Hills (66.01), Hammond Park (74), Just Us (39), Vine City (25), Fulton County-Airport Brownfield (82.02), Emory Village (224.02), tract 224.01 crosses both Virginia Highlands and Druid Hills neighborhoods, and Capitol Gateway (48).

The Midtown census tract is referred to as East Midtown going forward in order to distinguish this from the core and northern portions of Midtown that encompass less residential areas likely with distinctly higher income levels and home values due to its proximity to main streets and core commercial areas. The four selected neighborhoods are East Midtown, Vine City, Sylvan Hills and Capitol Gateway. Table 7 details the specific socioeconomic changes that each has undergone in these five years, along with the degree of change.

2010

Neighborhood	Population Density	Non-Hispanic White (%)	Vacant (%)	Median Home Value	Income Diversity Index
East Midtown	13.74	71%	11%	$ 388,500	3.01
Vine City	10.14	0%	37%	$ 123,800	2.80
Sylvan Hills	3.19	19%	25%	$ 129,000	3.54
Capitol Gateway	5.01	23%	29%	$ 122,800	1.91

2015

Neighborhood	Population Density	Non-Hispanic White (%)	Vacant (%)	Median Home Value	Income Diversity Index
East Midtown	13.92	60%	11%	$ 453,800	3.47
Vine City	10.23	3%	29%	$ 192,000	3.26
Sylvan Hills	4.59	16%	23%	$ 172,800	3.82
Capitol Gateway	10.79	19%	5%	$ 246,600	2.75

Table 7. Neighborhood Spotlights

Population density and vacancy rates were added to bring additional context and test whether the neighborhoods would also show similar trends in other socioeconomic factors. The table shows that the neighborhoods experienced the same directional changes in all of these socioeconomic categories. With the exception of East Midtown's vacancy rate that remained at 11%, every neighborhood experienced an increase in population density and a decrease in vacancy, two trends often cited as signs of neighborhood improvement or revitalization.

The only exception is Vine City. Vine City's vacancy rate decreased significantly and the population density increased slightly, however percent White increased to 3%. This tract should have been excluded from the final outlier selection based on this fact, however, there were thirteen census tracts that had 0% White residents in 2010 which created errors in calculating percent change. Vine City was one of these neighborhoods, but this neighborhood did in fact experience an increase in White residents. However, the tract was included in this neighborhood analysis to provide a comparison.

Capitol Gateway experienced the most dramatic change among all four neighborhoods, with population density more than doubling and median home value more than doubling. Income diversity increased significantly and percent White decreased. ACS survey data confirms that the percent Black residents decreased from 69% in 2010 to 63% in 2015. The population also doubled in this same period. This suggests that the neighborhood likely has become more racially diverse across multiple ethnicities. It is possible, however, that the income diversity has increased due to high income individuals or families moving into the neighborhood considering the increase in home value and sharp decrease in vacancy. These patterns suggest that the changes are likely connected to residents moving *into* the neighborhood. This could suggest that the neighborhood is poised for possible displacement consequences, principally due to the degree to which home value and population has increased. Capitol Gateway's median home value in 2010 was well below Fulton County's median home value of $253,100 at that time. However, in five years, Capitol Gateway's median home value has increased to a value above the county's 2015 median of $241,300 (ACS 5-year estimates).

Out of the four neighborhoods highlighted, Sylvan Hills appears to show the most "balanced" degree of change or neighborhood improvement when it comes to increase in home value and in income diversity. This neighborhood is particularly striking as it started with a high level of income diversity of 3.54 in 2010. The decrease in percent White is not argued to be an indicator of neighborhood improvement in this study, however, percent White is included as in indicator of racial change in the neighborhood as drastic increase in percent White residents are often associated with rapid gentrification processes. Further investigation would be required in order to confirm whether there is overall diversity of racial groups in this neighborhood. However, this study purposefully centered its hypotheses and methods on changes in income

diversity rather than a focus on racial diversity as the two are both separate and interrelated in complex ways in the context of neighborhood change.

VII. Conclusions and Further Research

Neighborhood change, in particular processes of gentrification that result in displacement, has been a point of increasing attention in the planning and community development fields over the last two decades. The process has partially garnered this attention as it can result in new opportunities for a neighborhood, as well its historic and new residents, however, it can just as easily result in uprooting historic residents from their homes through contributing to spikes in housing costs. Through three different steps of spatial and statistical analyses, this study researched whether it is possible for a neighborhood to experience this kind of positive economic improvement while either maintaining social conditions for existing residents or increasing income diversity of residents in a way that does not drastically impact stability of existing residents.

Results found that vacancy, diversity in housing tenure, and race all have strong explanatory relationships to large changes in income diversity. Population density was found to have a non-linear relationship with income diversity. However, interestingly enough, the four neighborhood snap shots showed that each of these neighborhood change outliers experienced an increase in density while also experiencing increases in home value and income diversity.

Numerous reasons were detailed previously in the study for the importance of this income diversity, but Lance Freeman highlights an additional reason while referencing Massey's argument for the compounding impact this class segregation has even on political inequities: "[h]igh levels of segregation by class also make it more likely that political boundaries will

coincide with class specific enclaves. This serves to reinforce political inequality by separating the 'haves' and 'have nots' into separate political jurisdictions (Massey, 1996 and Freeman 2008). Whether linked to access to political power, economic mobility or to housing stability, diverse neighborhoods are a key consideration for any practitioner in urban planning or community development that is concerned with equitable outcomes from neighborhood development.

Further research is necessary to identify whether the twenty-two neighborhoods highlighted from these results are true models for neighborhood change. One key component to identifying neighborhood models that can inform revitalization or housing policies is being able to identify at which point in the process of revitalization these neighborhoods fall. For example, some neighborhoods may show strong increase in home value, indicating good economic trajectory, while also showing stable or increasing income diversity. However, it is not possible from this analysis to identify whether the neighborhood is early enough in the revitalization process that negative social impacts may simply be on the horizon. Lastly, it is crucial to apply an affordable housing lens to this analysis.

Given the time constraints of this study, no further housing policy analysis was conducted to frame these results in the context of possible policy measures that can act as ways to mitigate negative social impacts when a neighborhood undergoes positive economic revitalization. For example, a look into policies such as property tax circuit breakers, housing land trusts, and inclusionary zoning policies could round out the quantitative results from this study. This study provides the basis for analyzing changes over time in these neighborhoods where such housing policies are lacking. However, these neighborhoods could be the exact places that would benefit most from these policies. The combination of identifying neighborhoods with this trajectory and

coupling it with thoughtful policy and development is what could ultimately solidify these as models for balanced neighborhood change.

References

Atkinson, Rowland. (2000). Measuring Gentrification and Displacement in Greater London. *Urban Studies,* 37, 149-165.

Barton, Michael. (2016). An exploration of the importance of the strategy used to identify gentrification. *Urban Studies,* 53(1), 92-111.

Bertrand, Natasha. (2015). Atlanta is the Most Unequal City in America—Here's Why. *Business Insider*. Retrieved from: http://www.businessinsider.com/atlanta-is-the-most-unequal-city-in-america--heres-why-2015-3

Briggs, X.-S. (2006). *The geography of opportunity: Race and housing choice in metropolitan America.* Washington, DC: Brookings Institution Press.

Briggs, X.-S. (2005). Social Mixing and the 'Geography of Opportunity': Lessons for Policy and Unanswered Questions. *Massachusetts Institute of Technology.*

Defillipis and Frasier. (2010). Why do We Want Mixed-Income Housing and Neighborhoods?.

Dye, Richard F. and Daniel P, McMillen. (2007). Teardowns and Land Values in the Chicago Metropolitan Area. *Journal of Urban Economics,* 61, 45-63.

Duke, Joanna. (2009).Mixed Income Housing Policy and Public Housing Residents 'Right to the City'. *Critical Social Policy,* 29 (100), 100–120.

Eckerd, Adam. (2011). Cleaning up with Cleaning Out? A Spatial Assessment of Environmental Gentrification. *Urban Affairs Review,* 47, 31-59.

Feldman, Justin. (2014). Gentrification, urban displacement and affordable housing: Overview and research roundup. *Harvard Kennedy School Journalist's Resource*. Accessed from: https://journalistsresource.org/studies/economics/real-estate/gentrification-urban-displacement-affordable-housing-overview-research-roundup

Flanagan, E., Lachapelle, U. & El-Geneidy, A. (2016). Riding tandem: Does cycling infrastructure investment mirror gentrification and privilege in Portland, OR and Chicago, IL? Paper to be presented at the *95th Annual Meeting of the Transportation Research Board*.

Galster, G. C., & Killen, S. P. (1995). The geography of metropolitan opportunity: A reconnaissance and conceptual framework. *Housing Policy Debate*, 6 (1), 7–44.

Galster, George, Jason C. Booza, Kurt Metzger, and Jackie Cutsinger. (2005). An Analysis and Inventory of Mixed-Income/Mixed-Race Neighborhoods. Detroit, MI: Center for Urban Studies, Wayne State University.

Galster, George and Stephen Peacock. (1986). Urban Gentrification: Evaluating Alternative Indicators. *Social Indicators Research*, 18, 321-337.

Freeman, Lance. Neighbourhood (2008). Diversity, Metropolitan Segregation and Gentrification: What Are the Links in the US? *Urban Studies*, 46(10), 2079-2101.

Glick, Jonathan. (2008). Gentrification and the Racialized Geography of Home Equity. *Urban Affairs Review*, 44, 280-295.

Hammel, Daniel J. and Elvin K. Wyly. (1996). A Model for Identifying Gentrified Areas with Census Data. *Urban Geography*, 248-268.

Hedman, Lina and George Galster. (2013). Neighborhood Income Sorting and the Effects of Neighborhood Income Mix on Income: A Holistic Empirical Exploration. *Urban Studies*, 50 (1), 107-127.

Hudspeth, Nancy. (2003). Interpreting Neighborhood Change in Chicago. Nathalie P. Voohees Center. University of Illinois at Chicago.

Knotts, H. Gibbs and Moshe Haspel. (2006). The Impact of Gentrification on Voter Turnout. *Social Science Quarterly*, 87, 110-121.

Massey, D. S., & Fischer, M. J. (2003). The geography of inequality in the United States, 1950–2000. W. G. Gale & J. Rothernberg Pack, Brookings-Wharton papers on urban affairs. Washington,DC: Brookings Institution.

McKinnish, Terra, Randall Walsh, and T. Kirk White. (2010). Who Gentrifies Low-Income Neighborhoods? *Journal of Urban Economics*, 67, 180-193.

Nelson, Peter B., Alexande Oberg, Lisa Nelson. (2010). Rural Gentrification and Linked

Migration in the United States. *Journal of Rural Studies*, 26, 343-352.

Rose, Damaris. (1984). Rethinking gentrification: beyond the uneven development of Marxist urban theory. *Environment and Planning D: Society and Space*, 1, 47–74.

Smith, Neil. (1982). Gentrification and Uneven Development. *Economic Geography*, 58, 139-55.

Smith, Neil. Gentrification. (1988). W. Van Vliet (Ed.), The Encyclopedia of Housing, Taylor & Francis, London.

Slater, Tom. "Neil Smith". (2016). Key Thinkers on Cities. University of Edinburgh. Latham, A. & Koch, R. (eds.). London: Sage.

Talen, Emily. (2006). Neighborhood-Level Social Diversity: Insights from Chicago. *Journal of the American Planning Association*. 72(4), 431-446.

U.S. Census Bureau. (2015). *Selected socioeconomic characteristics, 2011-2015 American Community Survey 5-year estimates.* Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t

U.S. Census Bureau. (2010). *Selected socioeconomic characteristics, 2006-2010 American Community Survey 5-year estimates.* Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t

Williams, Kristin N. (2015). Towards a Universal Operationalization of Gentrification. *The Official Journal of the North Carolina Sociological Association*, 13(2).

Appendix

Appendix A

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.816[a]	.665	.661	.381247269448443	.665	158.014	9

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	206.705	9	22.967	158.014	.000[b]
	Residual	104.070	716	.145		
	Total	310.776	725			

a. Dependent Variable: Income Diversity Index

b. Predictors: (Constant), Year Built_Diversity index, Med_HVal15, Pop_DensSQ15, Unit Type_Diversity Index, Subsid_Units, Tenure_Diversity Index, P_Vacant15, P_Black15, Pop_Dens15

Coefficientsa

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.

		B	Std. Error	Beta		
1	(Constant)	1.764	.100		17.722	.000
	Pop_Dens15	-.006	.009	-.036	-.687	.493
	Pop_DensSQ15	.000	.000	.046	.942	.347
	P_Black15	.308	.072	.145	4.262	.000
	P_Vacant15	-.671	.240	-.083	-2.795	.005
	Med_HVal15	-.003	.000	-.530	-18.872	.000
	Subsid_Units	-.001	.000	-.169	-6.604	.000
	Unit Type_Diversity Index	.101	.012	.222	8.133	.000
	Tenure_Diversity Index	.822	.057	.360	14.390	.000
	Year Built_Diversity index	.119	.024	.126	5.004	.000

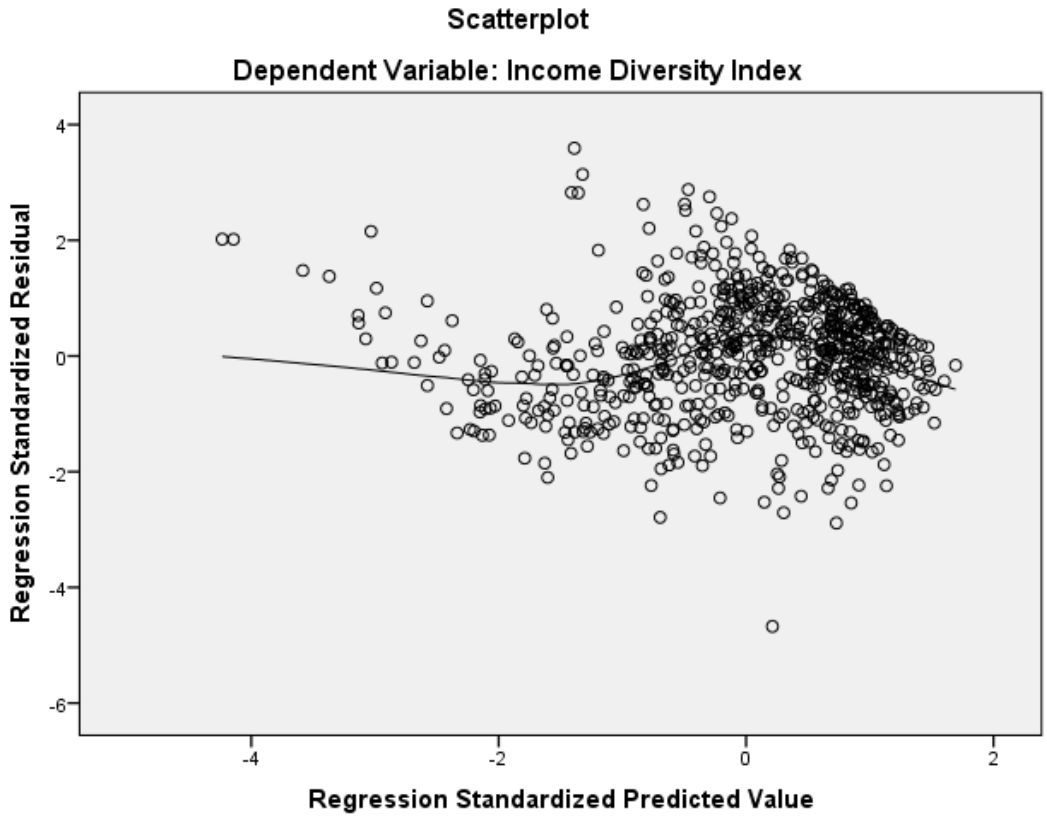
Collinearity Diagnostics[a]

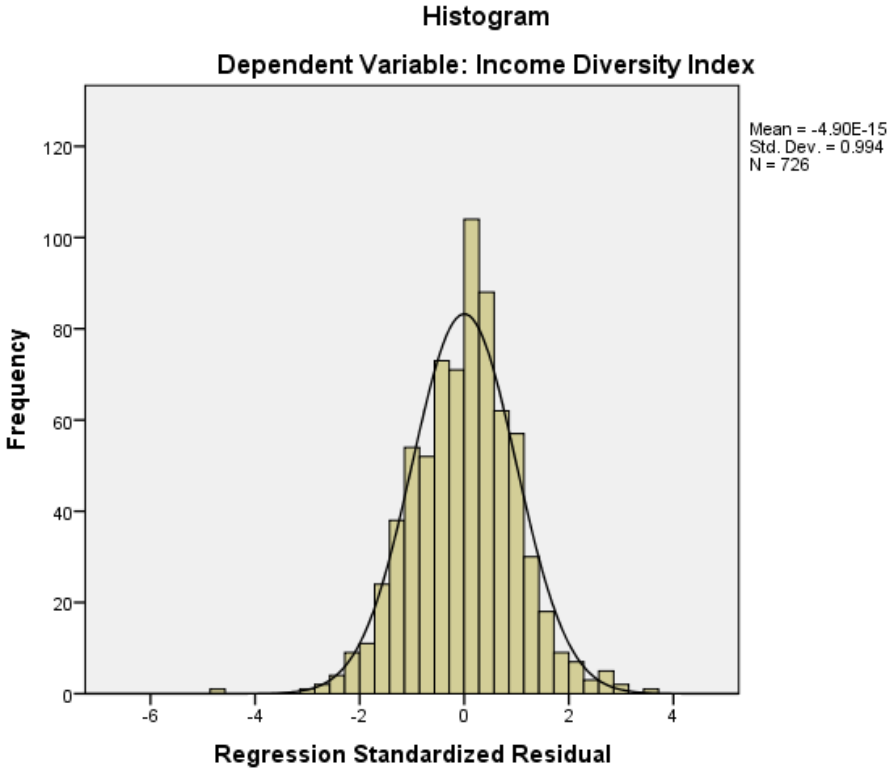
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Pop_Dens15	Pop_DensSQ15
1	1	7.085	1.000	.00	.00	.00
	2	1.049	2.599	.00	.01	.10
	3	.924	2.768	.00	.00	.01
	4	.421	4.102	.00	.00	.00
	5	.197	5.992	.00	.00	.04
	6	.148	6.914	.01	.00	.00
	7	.083	9.223	.01	.01	.00
	8	.048	12.123	.01	.78	.68
	9	.031	15.106	.09	.19	.16
	10	.012	23.942	.88	.01	.00

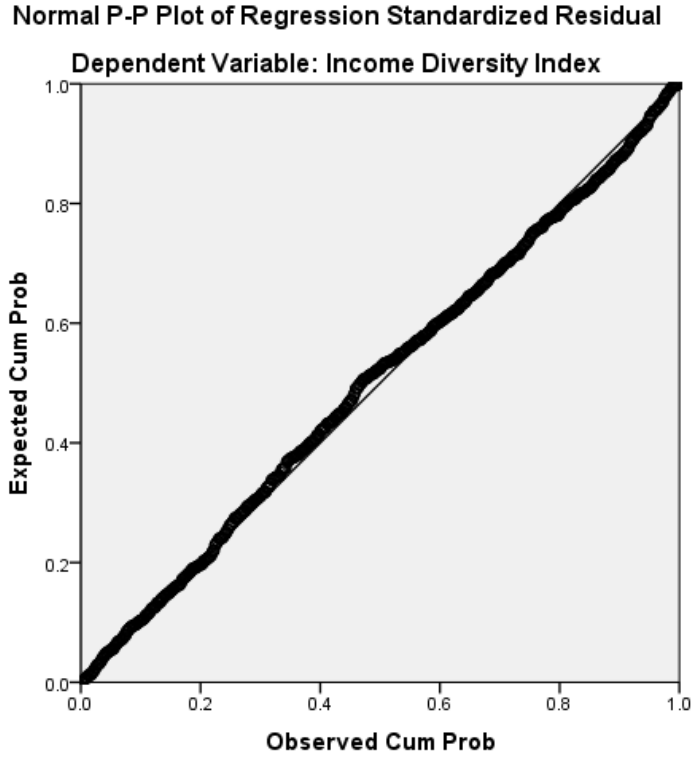
Collinearity Diagnostics[a]

Model	Dimension	Variance Proportions				
		P_Black15	P_Vacant15	Med_HVal15	Subsid_Units	Unit Type_Diversity Index
1	1	.00	.00	.00	.00	.00
	2	.01	.00	.00	.03	.00
	3	.01	.00	.05	.30	.00
	4	.07	.06	.11	.55	.00
	5	.07	.00	.07	.01	.59
	6	.11	.80	.10	.00	.01
	7	.60	.02	.52	.04	.08
	8	.05	.02	.02	.02	.29
	9	.04	.07	.00	.05	.00
	10	.03	.01	.13	.00	.03

Appendix B




Histogram
Dependent Variable: Income Diversity Index
Mean = -4.90E-15
Std. Dev. = 0.994
N = 726
Frequency
Regression Standardized Residual


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Income Diversity Index
Expected Cum Prob
Observed Cum Prob

Appendix C

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.823[a]	.677	.673	.374606976902764

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	210.299	9	23.367	166.511	.000[b]
	Residual	100.477	716	.140		
	Total	310.776	725			

a. Dependent Variable: Income Diversity Index

b. Predictors: (Constant), Year Built_Diversity index, Med_HVal15, Pop_DensSQ15, Unit Type_Diversity Index, Subsid_Units, Tenure_Diversity Index, P_Vacant15, P_White15, Pop_Dens15

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.119	.101		21.032	.000
	Pop_Dens15	-.015	.009	-.087	-1.650	.099
	Pop_DensSQ15	.001	.000	.081	1.658	.098
	P_White15	-.547	.082	-.237	-6.665	.000
	P_Vacant15	-.771	.227	-.095	-3.395	.001
	Med_HVal15	-.002	.000	-.460	-14.890	.000
	Subsid_Units	-.001	.000	-.159	-6.619	.000
	Unit Type_Diversity Index	.087	.012	.190	7.111	.000
	Tenure_Diversity Index	.789	.056	.346	13.981	.000
	Year Built_Diversity index	.139	.024	.147	5.907	.000

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	Pop_Dens15	.163	6.139
	Pop_DensSQ15	.189	5.294
	P_White15	.356	2.806
	P_Vacant15	.579	1.726
	Med_HVal15	.474	2.110
	Subsid_Units	.785	1.274
	Unit Type_Diversity Index	.633	1.580
	Tenure_Diversity Index	.738	1.355
	Year Built_Diversity index	.730	1.369

Collinearity Diagnostics[a]

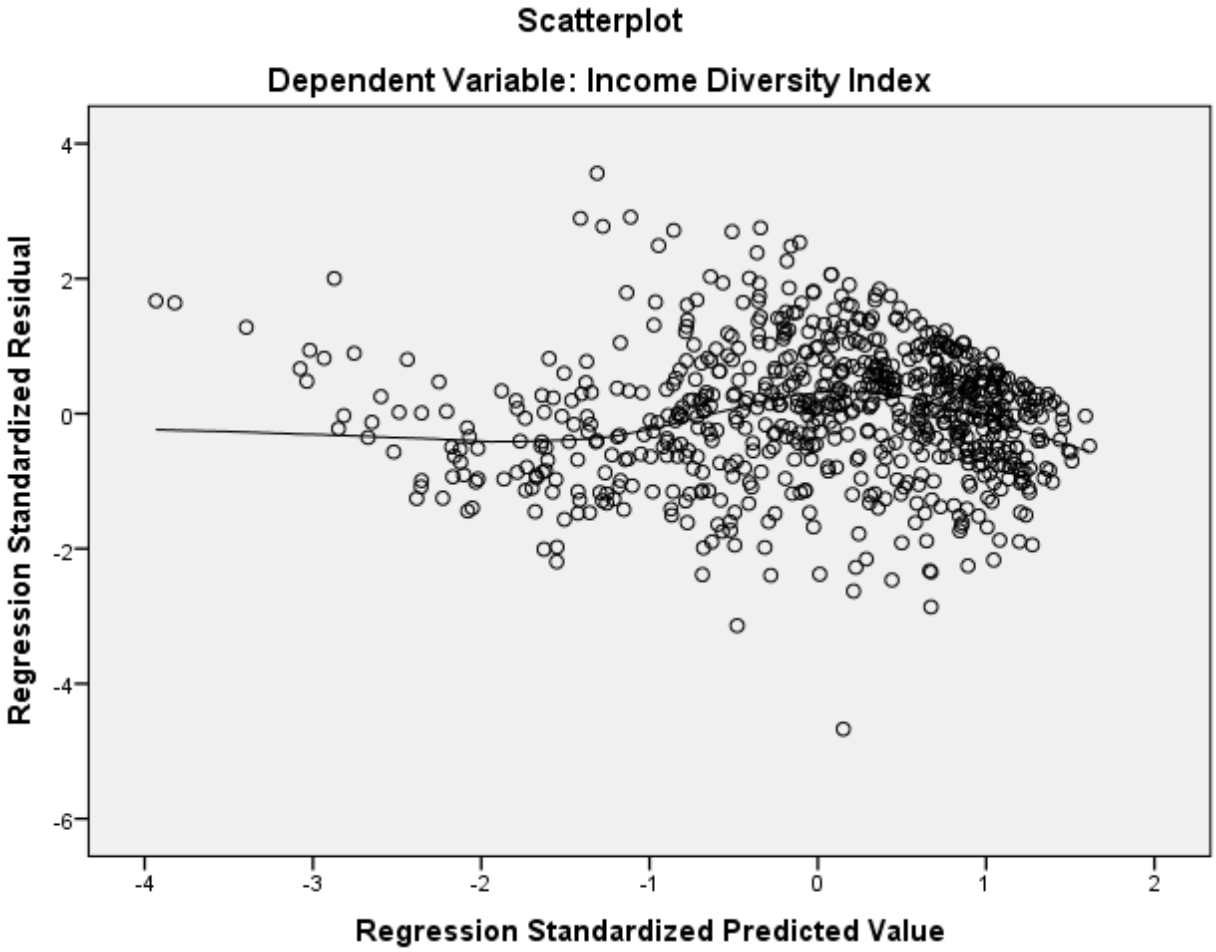
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	Pop_Dens15	Pop_DensSQ15
1	1	7.037	1.000	.00	.00	.00
	2	1.137	2.488	.00	.01	.04
	3	.926	2.757	.00	.01	.06
	4	.420	4.095	.00	.00	.01
	5	.188	6.118	.00	.01	.03
	6	.131	7.320	.02	.00	.00
	7	.070	9.997	.01	.07	.04
	8	.047	12.187	.00	.62	.54
	9	.031	14.982	.08	.27	.25
	10	.012	24.495	.89	.02	.02

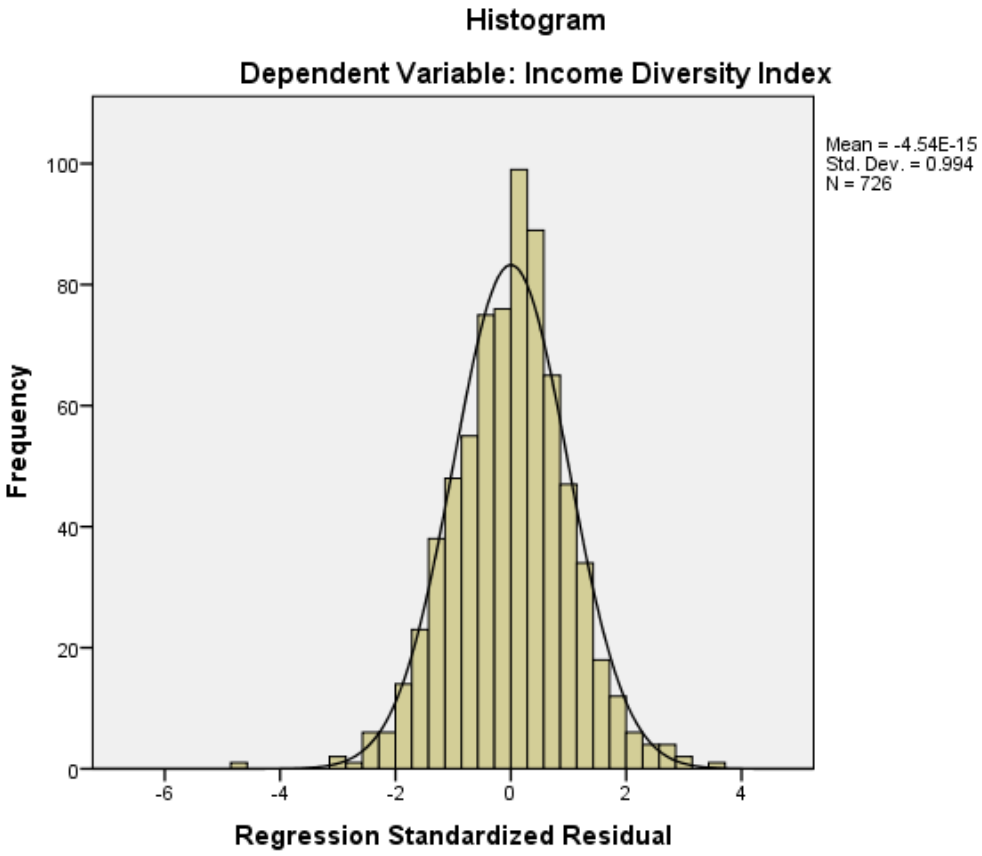
Collinearity Diagnostics[a]

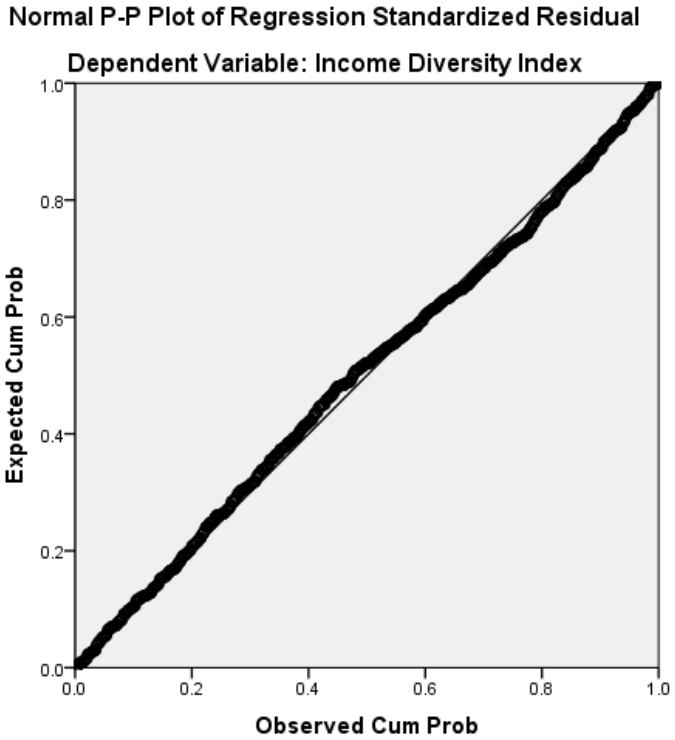
Model	Dimension	Variance Proportions				
		P_White15	P_Vacant15	Med_HVal15	Subsid_Units	Unit Type_Diversity Index
1	1	.00	.00	.00	.00	.00
	2	.02	.00	.02	.12	.00
	3	.00	.02	.00	.25	.00

	4	.04	.11	.04	.58	.02
	5	.02	.22	.00	.00	.56
	6	.02	.34	.46	.00	.02
	7	.68	.22	.37	.00	.25
	8	.11	.06	.05	.01	.11
	9	.03	.01	.05	.02	.00
	10	.09	.01	.00	.01	.03

Appendix D




Histogram
Dependent Variable: Income Diversity Index
Mean = -4.54E-15
Std. Dev. = 0.994
N = 726
Frequency
Regression Standardized Residual


Normal P-P Plot of Regression Standardized Residual
Dependent Variable: Income Diversity Index
Expected Cum Prob
Observed Cum Prob